



## Backyard Recirculation Aquaculture System

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### Abstract

Aquaculture has become a popular alternative to traditional fishing, providing a sustainable source of protein. The recirculation aquaculture system (RAS) is one of the latest advancements in aquaculture technology that helps to maintain a healthy and stable environment for fish to grow. In this article, we explore the backyard recirculation aquaculture system, which is a smaller, more accessible version of the RAS. We discuss the design, operation, and benefits of this system and its potential for use in small-scale aquaculture production.

### Introduction

The backyard recirculation aquaculture system (BRAS) is a closed-loop aquaculture system that allows fish to be raised in a controlled environment. This system is suitable for small-scale aquaculture production, including home-based or backyard aquaculture. The BRAS is a type of recirculation aquaculture system (RAS) that is smaller, more affordable, and easier to maintain than traditional RAS. The BRAS can be designed and constructed using locally available materials, making it accessible to small-scale farmers and hobbyists. This article provides an overview of the BRAS, its design, operation, and the benefits it offers.

### Design of BRAS

The design of the BRAS involves a series of tanks that are connected to each other to form a closed-loop system. The system includes a fish tank, a biofilter tank, and a sump tank. The fish tank is where the fish are kept and fed. The biofilter tank contains a filtration system that helps to remove waste and maintain water quality. The sump tank acts as a reservoir for the water and helps to



regulate the water level in the system. A pump is used to move water from the sump tank to the biofilter tank, and then back to the fish tank.

### **Operation of BRAS**

The BRAS is designed to provide a stable and healthy environment for the fish to grow. The system operates by circulating water through the tanks and filtration system to maintain a balanced ecosystem. The biofilter tank is where the nitrification process occurs, which converts harmful ammonia from fish waste into nitrate, a nutrient that plants can absorb. This process helps to remove excess nutrients from the water, which can cause harmful algal blooms in natural bodies of water. The BRAS can also be used to grow plants, such as vegetables or herbs, using the nutrient-rich water from the biofilter tank.

### **Benefits of BRAS**

The BRAS offers several benefits over traditional aquaculture systems. First, it is a closed-loop system that recirculates water, which reduces the need for water exchange and conserves water. Second, the BRAS can be designed and constructed using locally available materials, making it affordable and accessible to small-scale farmers and hobbyists. Third, the system can be used to grow both fish and plants, which can provide a source of protein and vegetables for household consumption or local markets. Finally, the BRAS can help to reduce the environmental impact of aquaculture by reducing the discharge of waste and nutrients into natural bodies of water.

In addition to the potential environmental benefits of using a backyard recirculation aquaculture system, there are also economic advantages. By growing fish in a controlled environment, backyard aquaculture can produce a reliable source of high-quality protein and reduce the costs of purchasing fish from external sources. Moreover, it can provide a source of income for households through the sale of surplus fish or juveniles for stocking ponds. This can be particularly beneficial in rural areas where job opportunities are limited.

However, backyard recirculation aquaculture systems also face challenges. The initial investment required to set up a system can be high, and ongoing costs for electricity and maintenance can also be significant. The need for careful monitoring and maintenance can also be a barrier for some individuals. Additionally, it is important to ensure that the system is properly designed to avoid negative impacts on the surrounding environment, such as pollution from discharge or the potential spread of disease to wild fish populations.

Overall, backyard recirculation aquaculture systems have the potential to provide a sustainable source of protein while also contributing to household income and reducing environmental impacts.



With proper planning, design, and management, these systems can be a viable option for small-scale aquaculture production.

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